NASA Data Assimilation Office AIRS Assimilation and Impact Assessment Plan

Robert Atlas, Head

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What will we assimilate and evaluate?

- Statistical Retrievals of temperature and humidity (obtained through Goldberg)

- Physical Retrievals (through Goldberg/AIRS team)

- Level 1b radiances (through Goldberg) via 1DVAR (interactive retrievals) initially

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How will we evaluate the data?

- Compute observed minus forecast (O-F) residuals (assimilate as a passive data type) for
  - Radiances (compare results with AIRS forward model and OPTRAN)
  - Retrievals (compare statistical, physical, interactive)

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What do we do with the O-F's?

- Estimate biases with respect to the assimilation data set (DAO system currently estimates and corrects for model bias in humidity, full bias correction undergoing validation)

- Estimate and model random and correlated (horizontal and vertical) components of the observation error

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How will we optimize use of AIRS data?

- Covariance tuning (maximum-likelihood approach using radiosondes and forecasts) to get accurate estimate of retrieval errors (will include vertical and horizontal correlations)

- Bias correction of
  – Retrievals (as done previously for TOVS)
  – Radiances (using collocated radiosondes) as for TOVS

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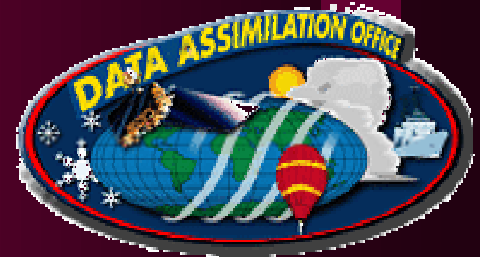
What other evaluation will be performed?

- Generation of high-resolution data sets with aircraft (ACARS) data

- Collocation with other <u>in situ</u> data sets as well as global and regional analyses

- Synoptic evaluation by highly skilled meteorological analysts

- Evaluation of objective quality control in the data assimilation system

- Forecast impact assessment with DAO's assimilation system (a version of the NCEP system can also be run at the DAO)

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What can we feedback to the AIRS science team?

- Retrieval and radiance error estimates
- Information on biases (both for retrievals and radiances)
- Information on instrument stability
- Information on quality of other products through assimilation of data from other instruments (e.g. ozone from TOMS, SBUV)
- Results of quality control decisions, forecast experiments, synoptic evaluation, collocation comparisons

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What assimilation issues will we focus on?

- Which form of the data gives us the best results?

- Does cloud-cleared data give a positive impact?

- Does land-affected data give a positive impact?

- How does channel selection impact the results?

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Summary

- DAO will evaluate/assimilate retrievals and radiances using many available tools and techniques

- The DAO's DAS with bias correction scheme (and some non-standard products) provides a unique data set for assessing instrument and forward model biases

- DAO will feed back all relevant information to the AIRS science team in a timely manner

- DAO in conjunction with colleagues at NCEP will be addressing fundamental assimilation issues with AIRS **data** (e.g. data usage, information content, and optimization)

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Summary continued

- DAO will provide a continuing and final assessment of the impact of AIRS on global analysis and forecasting

- Use of AIRS data in reanalyses will provide the scientific community with a comprehensive and accurate data set for interdisciplinary research